

REMARKS

Claims 1-4 are pending. Claim 2 has been amended by way of the present amendment.

103(a) Rejections over Segal in view of Yoshihara

Claims 1 and 3 were rejected under 35 U.S.C. 103(a) as being unpatentable over Segal (U.S. Patent No. 3,769,260) in view of Yoshihara (U.S. Patent No. 5,399,605). Applicants traverse the rejections.

Claim 1 recites "a polyester resin composition for engine peripheral parts, the resin composition comprising: (A) 60-92% by weight of at least one polymer selected from the group consisting of polyethylene terephthalate and an ethylene terephthalate copolymer; (B) 5-15% by weight of talc; and (C) 3-25% by weight of an olefin polymer, wherein a molded article produced from the resin composition has a flexural strain at break of 3.5% or higher and a deflection temperature under load of 180°C or higher."

As described in the specification, a polyester resin composition for engine peripheral parts requires apparently conflicting properties, i.e., heat distortion resistance and rigidity as well as impact resistance. Heat distortion resistance and rigidity can be improved by adding inorganic reinforcement material to the resin composition. However, a molded article produced from such a composition is rigid and brittle. The impact resistance of the molded article can be improved by finely dispersing a flexible resin having an affinity for the polyester resin in the polyester resin composition. However, a molded article produced from such a composition has impaired rigidity and heat distortion resistance. Further, the combined use of the inorganic reinforcement material and the flexible resin may counteract their respective positive effects and further impair desired physical properties. Therefore, it is difficult for a polyester resin composition to simultaneously have heat distortion resistance and rigidity as well as impact resistance, and thus often fails to perform practically.

The resin composition of Claim 1, by comprising the components in the particular proportions as recited, ensures the attainment of apparently conflicting properties, i.e., heat distortion resistance and impact resistance, which are required of engine peripheral parts and which were previously difficult to attain simultaneously. A preferred molded article produced from the resin composition also has a good appearance.

Segal

Segal discloses a resin composition comprising 25-95 wt.% of polyethylene terephthalate, 0.5-30 wt.% of polyolefin, and 2-70 wt.% of a filler. See, e.g., Segal, claim 1. Although Segal, in column 6, lines 23-27, discloses specific examples of the fillers, Segal fails to teach or suggest talc. The Office Action concedes that Segal does not include the claimed talc. See the Office Action, pg. 3.

Moreover, in the results of Comparative Examples 1-3 and 5 shown in Table 2 of the specification, it is clear that even when resin compositions comprise polyethylene terephthalate, polyolefin, and a conventional inorganic filler other than talc, molded articles produced from such resin compositions exhibit low deflection temperatures under load, and thus do not have satisfactory heat distortion resistance. As is clear from Comparative Example 4, the use of glass fiber as a filler results in insufficient fluidity, such that a molded article produced from such a resin has a poor appearance.

In contrast, as established by Example 6 in the specification, when a resin composition comprises polyethylene terephthalate and polyolefin in the same amounts as in the aforementioned Comparative Examples but includes talc, instead of the conventional inorganic fillers, a preferred molded article produced from such a resin composition has good impact resistance, heat distortion resistance, and appearance.

Furthermore, Segal does not disclose attaining impact resistance and heat distortion resistance without impairing appearance.

Yoshihara.

Yoshihara discloses a polyester resin composition comprising: 55-70 parts by weight of mainly polybutylene terephthalate; 30-45 parts by weight of mainly polyethylene terephthalate; and 0.1-10 parts by weight of a specific polyalkylene glycol. See, e.g., Yoshihara, claim 1. If necessary or required, the resin composition also comprises not more than 120 parts by weight of an inorganic reinforcing agent. Polybutylene terephthalate is the main component in the composition.

In contrast, Claim 1 of the present invention recites either polyethylene terephthalate or ethylene terephthalate copolymer as a main component in the claimed embodiment.

Generally, the crystallization rates of polybutylene terephthalate and polyethylene terephthalate are known to be significantly different. It is therefore reasonable to believe that the physical properties of Yoshihara's resin composition including polybutylene terephthalate

are significantly different from those of the claimed embodiment including polyethylene terephthalate.

Moreover, the claimed embodiment comprises particular proportions of specific resin components in order to attain the desired physical properties, i.e., heat distortion resistance and impact resistance, as indicated by flexural strain and deflection temperature.

For example, in Comparative Examples 6-9 of the specification, the compositions include 10 wt.% of talc and polyethylene terephthalate, but not an olefin polymer, as in the claimed embodiment. The resulting resin compositions could not satisfy the requirements for deflection temperature under load and flexural strain at break, thereby not attaining the desired impact resistance and heat resistance simultaneously, and resulting in poor appearance. In Comparative Examples 10 and 11 of the specification, the compositions do include an olefin polymer, but in proportions outside that of the claimed embodiment. The resulting resin compositions also fail to attain all the desired physical properties. Hence, at least the claimed components in the claimed proportions may attain the desired physical properties.

Although Yoshihara may include talc in a resin composition, absent the components and proportions of the claimed embodiment, Yoshihara would still not provide the claimed resin composition having the desired physical properties.

To support an argument that Yoshihara is appropriate prior art, the Examiner points out an expectation of success of Yoshihara in reducing post-shrinkages. See the Office Action, page. 3. As pointed out by the Examiner, Yoshihara, in column 6, lines 22-29, teaches the measurement of degree of post-shrinkage as a method for measuring dimensional stability. However, the degree of post-shrinkage measured in Yoshihara denotes the extent of dimensional change which occurs after molded articles are subjected to high temperature conditions. Hence, in Yoshihara, the use of talc contributes to the dimensional stability.

In contrast, the claimed deflection temperature under load denotes the temperature at which deflection occurs under a given load. This determines, for molded articles used at high temperatures, the maximum temperature at which the articles can withstand heat without deformation. Hence, the deflection temperature under load measures a different physical property than the post-shrinkages of Yoshihara. As such, an expectation of success in reducing post-shrinkages of Yoshihara would not suggest an expectation of success in withstanding high temperatures under load as in the claimed embodiment.

Combination of Segal and Yoshihara

Thus, even if one were motivated by Yoshihara to add the recited amount of talc to Segal, there would still not be a reasonable expectation of success in combining the particular components in particular proportions to attain the recited physical properties for flexural strain and deflection temperature.

Therefore, Claims 1 and 3 are not obvious over Segal in view of Yoshihara.

103(a) Rejections over Segal

Claims 2 and 4 were rejected under 35 U.S.C. 103(a) as being unpatentable over Segal. Applicants traverse the rejections.

Claim 2 recites "a polyester resin composition for engine peripheral parts, the resin composition comprising: (A) 100 parts by weight of at least one polymer selected from the group consisting of polyethylene terephthalate and an ethylene terephthalate copolymer; (B) 5-70 parts by weight of an inorganic reinforcement material; (C) 2-20 parts by weight of an ethylene polymer having a melt flow rate of 5 or lower; and (D) 3-20 parts by weight of a propylene polymer having a melt flow rate of 5-100, wherein a molded article produced from the resin composition has a flexural strain at break of 3.5% or higher and a deflection temperature under load of 180°C or higher."

The resin composition of the embodiment of Claim 2, as with the resin composition of the embodiment of Claim 1, can ensure impact resistance and heat distortion resistance without impairing other important physical properties, such as appearance, and can demonstrate outstanding characteristics for use in engine peripheral parts.

Segal, on the other hand, fails to teach the claimed ethylene and propylene polymers in the specified proportions.

The Examiner asserts that, while Segal is silent about the polypropylene polymer of the claimed embodiment, it would have been obvious to include the polypropylene polymer in Segal's composition. The Examiner further asserts that the claimed melt flow rate range is inherent in Segal's polypropylene. See the Office Action, pg. 5.

On the contrary, it is not sufficient to include just any polypropylene as the polyolefin, but rather a combination of polyolefin components that satisfy specific requirements (melt flow rates), i.e., 2-20 parts by weight of an ethylene polymer having a melt flow rate of 5 or lower and 3-20 parts by weight of a propylene polymer having a melt flow rate of 5-100. By using two polyolefin components in specific proportions that satisfy these specific

requirements, impact resistance and heat distortion resistance can be attained without impairing appearance. Absent these combinations at the claimed melt flow rates, all the desired physical properties cannot be simultaneously attained. Submitted herewith is a 1.132 Declaration demonstrating this.

In the Declaration, experimental Compositions 1-9 correspond to those of Examples 25-33 in the specification. Each of these compositions comprises a particular ethylene polymer in conjunction with a particular propylene polymer as described above. These compositions have excellent fluidity. Molded articles produced therefrom satisfy the requirements for flexural strain at break and deflection temperature under load, and exhibit excellent impact resistance and heat resistance.

In contrast, in the Declaration, Comparative Composition 1 includes the claimed ethylene polymer without the claimed propylene polymer. The resulting composition exhibits poor fluidity, and a molded article produced therefrom has inferior appearance. Comparative Composition 2 includes the claimed propylene polymer without the claimed ethylene polymer. The molded article produced therefrom exhibits poor flexural strain at break, resulting in inferior impact resistance. Comparative Composition 3 includes the claimed propylene polymer and an ethylene polymer with a melt flow rate outside the claimed range. The molded article produced therefrom exhibits poor flexural strain at break, resulting in inferior impact resistance. Comparative Composition 4 includes the claimed ethylene polymer and a propylene polymer with a melt flow rate outside the claimed range. The resulting composition exhibits poor fluidity. A molded article produced therefrom has poor appearance.

As is clear from these experimental results, to achieve the object of the present invention, i.e., to attain impact resistance and heat distortion resistance without impairing other important physical properties such as appearance, an ethylene polymer having a melt flow rate of 5 or lower and a propylene polymer having a melt flow rate of 5-100 should be used.

Since Segal neither teaches nor suggests using polyethylene and polypropylene in the recited combinations and fails to teach the recited melt flow rates, Segal does not fairly suggest the claimed invention.

Hence, Claims 2 and 4 are not obvious over Segal.

CONCLUSION

Applicants submit that the claims as presently written are allowable and an early and favorable action to that effect is respectfully requested.

The Examiner is invited to contact the undersigned at (202) 220-4200 to discuss any information concerning this application.

The Office is hereby authorized to charge any fees under 37 C.F.R. 1.16 or 1.17 or credit any overpayment to Kenyon & Kenyon Deposit Account No. 11-0600.

Respectfully submitted,

Date: 4/5/04

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Attachment: 1.132 Declaration



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Nori YOSHIHARA et al.

Appln. No. 09/590,814

Group Art Unit: 1713

Filed: June 9, 2000

Examiner: William K. Cheung

For: POLYESTER RESIN COMPOSITION FOR ENGINE PERIPHERAL
PARTS

DECLARATION

Honorable Commissioner of Patents and Trademarks

5 Washington, D.C. 20231

Sir :

I, Nori YOSHIHARA, hereby declare that:

1) I am one of the inventors of the present
invention; and

10 2) the experiments given below were carried out
under my general direction and supervision.

Experiment

Test pieces were prepared in the same manner as in Example 1 of the present specification except for using the ingredients of the compositions of the present invention and the comparative compositions in the proportions (parts by weight) shown in Table 1. The physical properties of the prepared test pieces were evaluated. The cylinder temperature of the injection molding machine during the production of the test pieces was set at 260-260-260°C.

In the Tables, the following abbreviations are used:

- PET: Polyethylene terephthalate (germanium catalyst, intrinsic viscosity: 0.70)
- 15 • GF: Glass fiber (length: 3 mm)
- PE copolymer I:
Ethylene-propylene-glycidyl methacrylate
copolymer (MFR: 3.0)
- PE copolymer II:
20 Ethylene-propylene modified with methacrylic
acid (MFR: 1.8)
- PE copolymer III:
Ethylene-ethyl acrylate-methyl methacrylate
(MFR: 22)
- 25 • PP copolymer I:

Polypropylene modified with maleic anhydride
(MFR: 75)

- PP copolymer II:

5 Polypropylene modified with glycidyl
methacrylate (MFR: 60)

- PP copolymer III:

Polypropylene modified with maleic anhydride
(MFR: 30)

- PP copolymer IV:

10 Polypropylene modified with maleic anhydride
(MFR: 9)

- PP copolymer V:

15 Polypropylene-butylene modified with maleic
anhydride (MFR: 9)

The physical properties of the test pieces were
evaluated by the following methods:

- 1) Melt flow rate (MFR)

20 Melt flow rate was determined according to ASTM-
D1238 by a melt indexer (manufactured by Toyo Seiki
Seisaku-Sho, Ltd.) at 230°C under a load of 21.2 N.

- 2) Flexural strain at break:

25 Test pieces (13 mm × 6.4 mm × 127 mm) were prepared
by injection molding at a resin temperature of 270°C and a
mold temperature of 120°C. The test pieces were subjected

to a flexural test according to ASTM-D-790 at a temperature of 23°C at 50% RH, and load-deflection was automatically recorded. Based on the deflection d (mm) when the test piece was broken, the flexural strain at break(γ) was determined by the following equation:

$$\gamma(\%) = 600td/L^2$$

t: thickness (mm), L: span (mm)

3) Deflection temperature under load:

Test pieces (13 mm × 6.4 mm × 127 mm) were prepared by injection molding under the same conditions as those of the above flexural strain test. The test pieces were tested by a heat distortion tester equipped with an automatic heat riser according to ASTM-D648 at a temperature of 23°C at 50% RH with the application of a load of 0.46 MPa.

4) Cowling product tests

(i) Fluidity

Molding was carried out by using an injection molding machine with the clamping force of 1000 tons and a barrel temperature setting of 260-260-260°C and a mold for cowling (400 mm × 550 mm × 80 mm, thickness: 2 mm) adjusted to 120°C. The molding cycle was 45 seconds. The fluidity of the resin composition was evaluated.

A: sufficiently filling the mold and good in appearance

B: short shot or defective appearance

(ii) Drop test

The cowlings obtained in (i) above were dropped with their emblem sides (front sides) facing down from a height of 1 m onto a steel plate placed on the floor of the testing room which was adjusted to a temperature of -30°C and 50% RH. The dropped cowlings were checked for damage.

A: No breakage found

B: Cracks, fracture and/or breakage found

10 (iii) Heat resistance

The cowlings obtained in (i) above were heated at 130°C for 300 hours, and then checked for appearance.

A: No noticeable deformation or discoloration found

B: Noticeable deformation or discoloration found

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Results

The results of the tests described above are shown in Table 1.

Table 1

	Compositions of the present invention										Comparative compositions			
	1	2	3	4	5	6	7	8	9		1	2	3	4
PET	100	100	100	100	100	100	100	100	100		100	100	100	100
GF	3	3	10	10	10	3	3	3	30		3	3	3	3
Talc	7	7	3	3	3	7	7	7	1		7	7	7	7
PE copolymer I	2	4	2	4	4		4	4	10		7			4
PE copolymer II						4					4			
PE copolymer III													4	
PP copolymer I	7.5	7.5	7.5	10		7.5			5			7.5	7.5	
PP copolymer II					10									
PP copolymer III							7.5							
PP copolymer IV								7.5						
PP copolymer V														7.5
Test piece	Bending strength(MPa)												100	108
	Flexural strain at break (%)												3.1	4.8
	Deflection temperature under load (°C)												195	203
Cowling product	Fluidity										B	A	A	B
	Drop test										A	B	B	A
	Heat resistance										A	A	A	A

Analysis

Compositions of the Present Invention 1-9 contained ethylene polymers having a melt flow rate of 5 or lower and propylene polymers having a melt flow rate of 5-100.

5 They had good fluidity, and molded articles produced therefrom exhibited good appearance and excellent heat and impact resistance.

Comparative Composition 1 contained an ethylene polymer having a melt flow rate of 5 or lower but did not
10 contain a propylene polymer. It had poor fluidity, and a molded article produced therefrom exhibited inferior appearance. Comparative Composition 2 contained a propylene polymer having a melt flow rate of 5-100 but did not contain an ethylene polymer. A molded article
15 produced therefrom exhibited poor flexural strain at break resulting in inferior impact resistance. Comparative Composition 3 contained an ethylene polymer having a large melt flow rate of 22. A molded article produced therefrom exhibited poor flexural strain at break resulting in
20 inferior impact resistance. Comparative composition 4 contained a propylene polymer having a small melt flow rate of 0.7 and exhibited poor fluidity. A molded article produced therefrom had poor appearance.

The results described above establish that:

25 To obtain molded articles having excellent appearance and

impact and heat resistance, it is essential to use in combination an ethylene polymer having a melt flow rate of 5 or lower and a propylene polymer having a melt flow rate of 5-100.

I, the undersigned, declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with
5 the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

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Date: March 25, 2004

Nori Yoshihara

Nori YOSHIHARA